

WE CLAIM:

1. A gas separation system for extracting a first gas fraction and a second gas fraction from a gas mixture including the first and second fractions, the gas separation system comprising:
  - a stator including a stator valve surface and a plurality of function compartments opening into the stator valve surface;
  - a rotor rotatably coupled to the stator and including a rotor valve surface in communication with the stator valve surface, a plurality of flow paths for receiving adsorbent material therein, and a plurality of apertures provided in the rotor valve surface and in communication with the flow paths for cyclically exposing the flow paths to the function compartments; and
  - at least one surge absorber in communication with the stator for reducing pressure variations in the function compartments.
2. The gas separation system according to claim 1, wherein the surge absorber comprises a primary surge chamber in communication with one of the function compartments, the primary surge chamber including a port for coupling to compression machinery, a secondary surge chamber in communication with another one of the function compartments, and a first flow restrictor in communication with the primary and secondary surge chambers for facilitating pressure letdown between the compression machinery and the another function compartment.
3. The gas separation system according to claim 2, wherein the secondary surge chamber comprise a plurality of tertiary surge chambers in communication with respective ones of the function compartments, and a plurality of second flow restrictors each being in communication with adjacent ones of the tertiary surge chambers for maintaining each said function compartment at one of a plurality of discrete pressure levels.
4. The gas separation system according to claim 2 or 3, wherein the compression machinery comprises one of a compressor, an expander, and a vacuum pump.
5. The gas separation system according to claim 2 or 3, wherein each said the flow restrictor comprises one of a fixed orifice, an adjustable throttle valve, and a pressure regulator.
6. The gas separation system according to claim 1, wherein the surge absorber comprises a plurality of parallel flow restriction channels, each said flow channel being coupled to a respective one of the function compartments and having a respective channel length for maintaining each said function compartment at one of a plurality of discrete pressure levels.
7. The gas separation system according to claim 6, wherein the surge absorber comprises a

plurality of parallel plates inclined relative to the function compartments, each said flow channel being defined between adjacent ones of the parallel plates.

8. The gas separation system according to claim 1, wherein the surge absorber comprises a surge chamber continually disposed in communication with a predetermined minimum number of the flow paths, the predetermined number of the flow paths defining an adsorbent volume, the surge absorber having a surge absorber volume at least equal to the adsorbent volume.

9. The gas separation system according to claim 8, wherein the surge absorber volume is at least twice the adsorbent volume.